UNIVERSITÄT HOHENHEIM

Department of Plant Production and Agroecology in the Tropics and Subtropics
Section: Crop Waterstress Management

Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung

Upland Rice Adaptation to Variable Water Availability Along an Altitude Gradient in Madagascar

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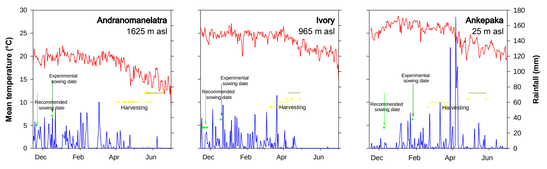
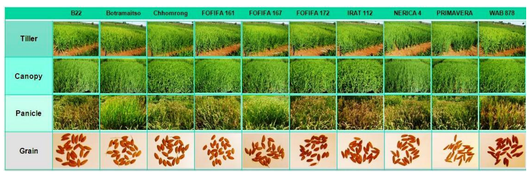
Introduction

Growing demand for rice and increasing pressure on irrigated land leads to upland rice supplementing irrigated rice. Rice is very sensitive to even short drought spells during sensitive phenological stages. Adaptation strategies are required to match varietal development and crop management with water availability and changes in the climatic environment imposed by climate change. Field experiments were conducted at three locations in Madagascar along altitude and temperature gradients ranging from hot-equatorial to the lower limit of the crop's thermal adaptation. Genotypic phenology was studied in relation to water use and climatic conditions.



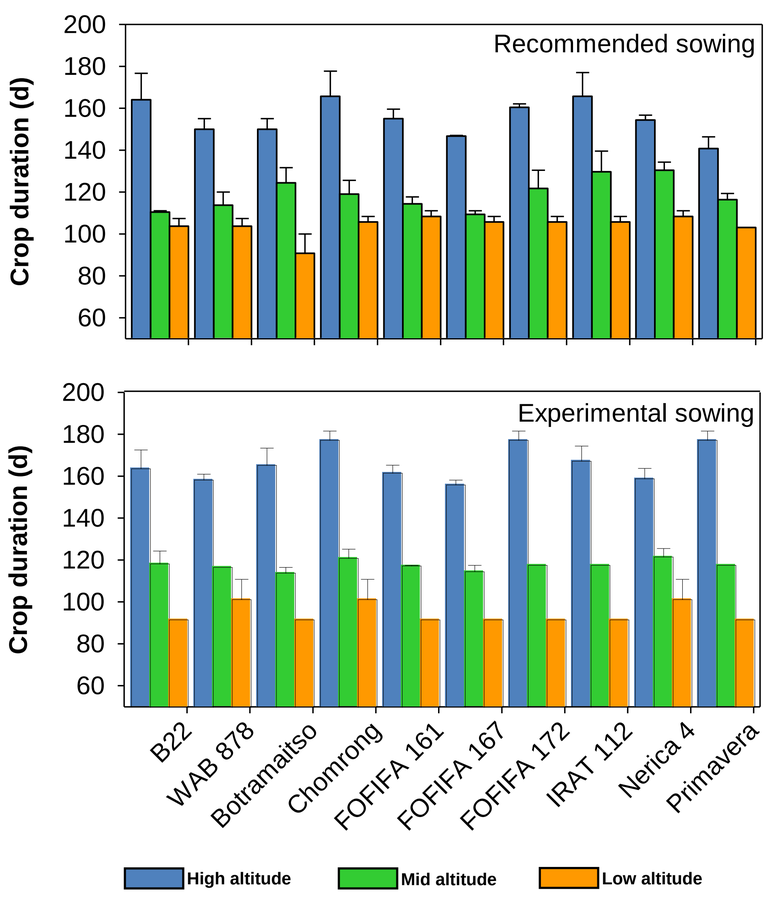


Conclusions

- ✓ Delay in sowing increases crop duration at higher altitudes.
- ✓ All genotypes performed best in mid altitude.
- ✓ In high altitude with delayed sowing Chomrong and FOFIFA varieties out performed other genotypes.
- ✓ Rain Use Efficiency is an inadequate indicator for water use in mountainous upland rice systems.

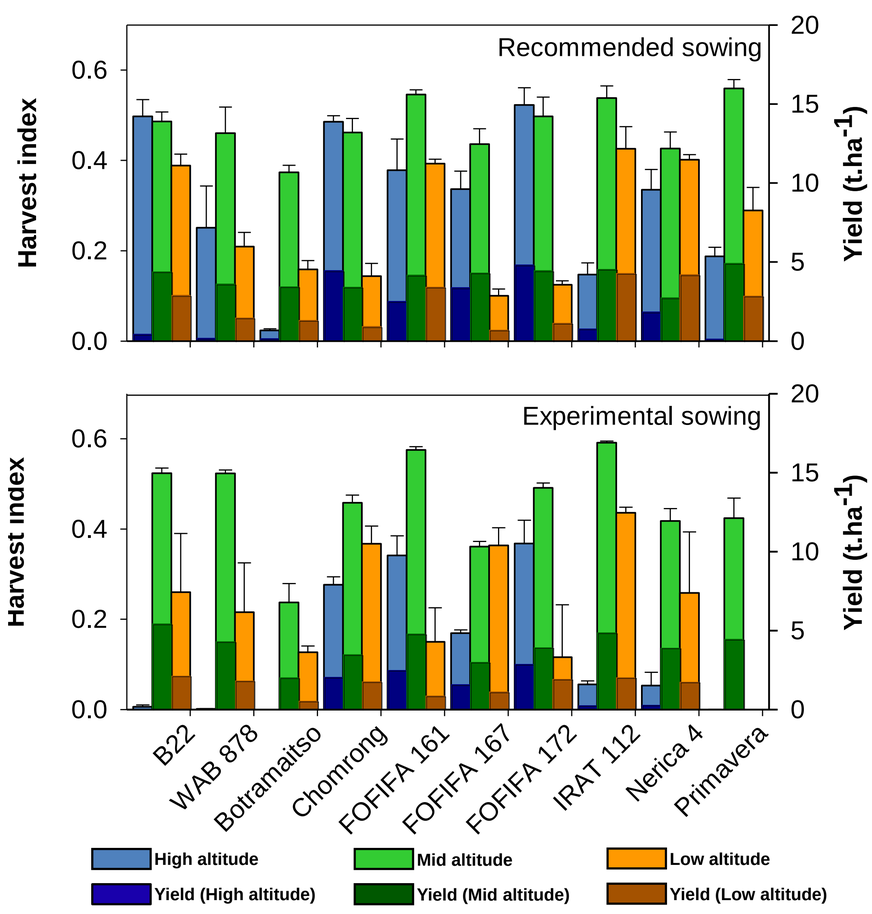
Results and Discussion

Crop Duration



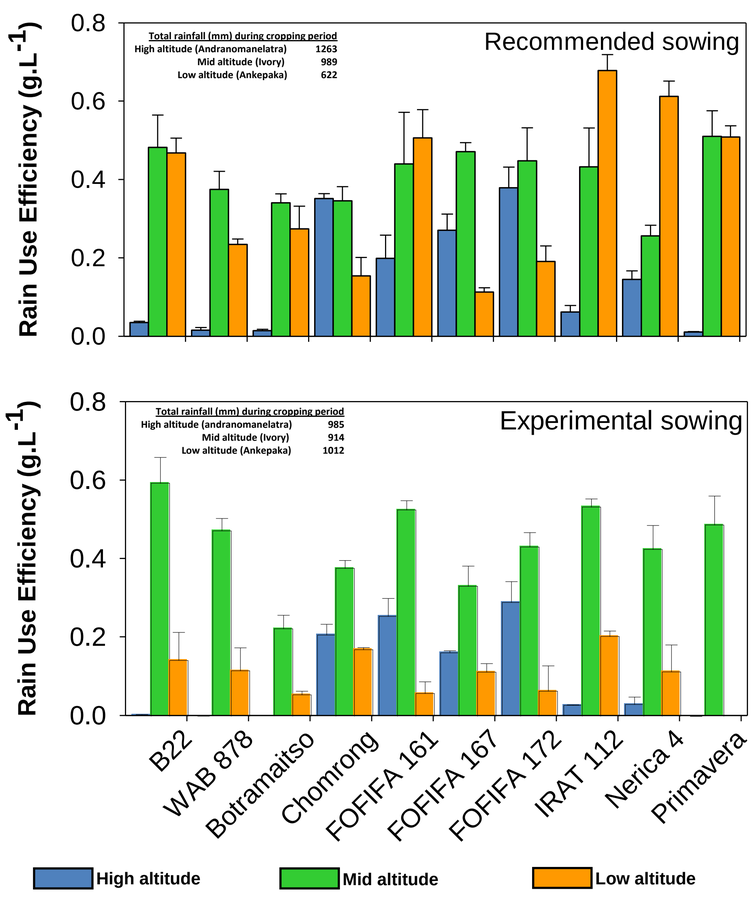
- High altitude conditions increase crop duration by 36 to 52 days.
- A month delay in sowing date affects crop duration differently depending on altitude.

Harvest Index



- All varieties yielded best under mid-altitude conditions.
- Delayed sowing constraints yields of all varieties but the cold tolerant varieties in high altitude .

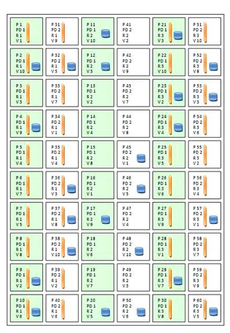
Rain Use Efficiency



- RUE is lower in higher altitude due to high run-off loss.
- RUE is higher for the recommended sowing date at lower altitude and for delayed sowing in mid-altitude.

Materials and Methods

- 10 varieties of upland rice were planted at 2 different sowing dates with 3 replications (RCBD) in three locations.
- Plot size was 4.8 X 3.8 m with 20 X 20 cm spacing between plants.
- Daily values for temperature, rainfall, relative humidity, solar radiation, wind speed were recorded.
- TDR and Mini lysimeter were installed in the field to measure soil moisture and bare soil evaporation.
- Different physiological and phenological stages were observed during crop cycle.
- Biomass, yield, and yield components were determined at maturity.



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